The Triumph of the Naked Mole Rat

By Joel Seligman

Each year the researchers at the University receive hundreds of millions of dollars in support from the federal government, foundations, and industry. Between 2000 and 2009, for example, total sponsored research funding at the University grew from $220 million to $355 million. As of October 31, 2009, we had received a further $34.9 million under the American Recovery and Reinvestment Act. Between July 2004 and June 2009 our Center for Emerging and Innovative Sciences delivered $607 million in economic impact to New York State by creating new jobs, saving companies money, and spurring spending on new equipment and infrastructure.

Behind each successful grant proposal is a story. The accounts of the ingenuity of our researchers provide cogent explanations as to why research universities are so vital to our nation's progress. Let me offer a few examples.

During my first year as University president, I visited the faculty of each department in the College of Arts, Sciences, and Engineering and asked them to tell me about their work. Their responses were fascinating, varied, and inspiring. The first two sentences of then Assistant Professor Vera Gorbunova's account were particularly memorable. "Why does the average squirrel live 10 times longer than the average rat? My challenge is to find out." She hypothesized that squirrels—which can live up to 24 years—had developed an anticancer mechanism that allows them to slow down cell division, including the uncontrolled cell growth seen in cancer.

Three years later I again met with the Department of Biology and recalling Professor Gorbunova's earlier question, asked, "Have you discovered the answer?" She may have.

Working with fellow University Biology Professor Andrei Seluanov, Gorbunova has focused on the naked mole rat that has never been found to have cancerous tumors. Gorbunova and Seluanov believe they have uncovered previously unknown anticancer mechanisms in certain long-lived rodents, including naked mole rats and squirrels, that appear to be different from anticancer mechanisms employed by humans and other mammals studied so far. If Gorbunova and others are able to isolate and understand this mechanism, they will be able to assess its potential applicability to assist human cells to thwart the onset of tumor growth. This is a potentially transformational result, a way to prevent cancer's creation. While it is too early to know whether this research and that of fellow scientists at other institutions will succeed, research universities are the world's leaders in addressing the basic science that makes this type of breakthrough possible.

Other research scientists at the University are involved in similarly potentially consequential discoveries. In July, Neurosurgery Professor Maiken Nedergaard and her team announced a most exciting—and unlikely—discovery. The researchers found that a compound akin to the blue dye in foods like M&Ms and Gatorade may offer a breakthrough treatment for spinal cord injuries.

▲ **BREAKTHROUGHS: Rochester scientists believe they may have found a previously undetected anticancer mechanism in naked mole rats, just one example of breakthrough research conducted by the University's faculty.**

The substance known as BBG, or Brilliant Blue G, appears to shut down the cascade of molecular events that cause secondary damage to the spinal cord. This damage, which happens in the hours following a spinal injury, often leaves patients with permanent paralysis. Nedergaard has been a pioneer in understanding the molecular chain of events that occurs following spinal injuries. She's focused much of her work on astrocytes, a form of glial cells that are central to the healthy functioning of the spinal cord and nervous system. Although it will likely take several years to fully test this new approach, Nedergaard is hopeful the research will yield a safe and practical treatment that will allow people who suffer spinal cord injuries to make dramatic recoveries.

Assistant Professor of Chemical Engineering Mitch Anthamatten is literally reshaping the way rubber is engineered, with striking results. Anthamatten is developing a new class of rubber compounds called shape-memory polymers that never forget their original shape.

When one of these polymers is stretched, molded, or altered, it can be returned to its original shape simply by heating it. For example, imagine if a car bumper made out of this shape-memory polymer were damaged in an accident. A repair would be as simple as applying heat.

Anthamatten did not invent the first shape-memory polymers, but his version is significant because engineers can control the speed at which Anthamatten's polymers return to their original shape. This could be important in a medical implant procedure, for instance, where a surgeon may want to temporarily deform an implant so that it could fit through a small incision, and have it stay deformed until it reaches its final destination in the body, at which point it could expand to its full, normal shape.

At the University, there are today approximately 1,800 faculty members who work in our science, engineering, and medical laboratories assisted by nearly 2,400 graduate students and postdoctoral fellows. Laboratories such as these at our University are the places where new discoveries that will transform our future are created.

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